

# 溫控

## Temperature Control

飼育兜鍬需要控溫大約是1999年左右才出現的概念。在那之前，從未聽任何人提及過把兜蟲或是鍬形蟲養在特定的溫度中。不管是哪裡採集到的個體，全部都養在室溫中。這也解釋了為什麼1999年以前深山鍬形蟲被視為是「生態未明」的「無法繁殖種」；不管給牠什麼樣的木屑或是產卵木，不生就是不生。不過這也難怪，在30度的室溫中牠怎麼可能會生呢？不死掉就已經很幸運了。當時真地是絞盡了腦汁，並且開始胡思亂想：是不是深山鍬形蟲需要產卵在活木裡？是不是平地的氣壓過大所以牠不肯產卵？答案有時候真的沒有那麼複雜，更可以說是遠在天邊近在眼前：把冷氣機打開就萬事ok了。當時爸媽真的覺得我瘋了，哪有什麼養蟲要吹冷氣的？並且是24小時不停地吹，人都沒有這麼好命。當時我只告訴他們所有的電費我負責，請他們就不要再唸了。當1個星期後發現高砂深山產了十多顆卵時，真的是興奮到全身發抖。今天，養蟲控溫已經是沒有任何人質疑的常識。但是控溫的方式卻有數種。飼育者就在空間以及電費之間嘗試找出最適合自己的平衡點。這裡提出最常使用的溫控方式及其優缺點。

That culturing rhinoceros and stag beetles requires a temperature-controlled environment is a concept that didn't appear until around 1999. Before then, all beetles were kept in room temperature. This explains why *Lucanus* stag beetles were viewed as "impossible" beetles to breed. I even started thinking perhaps these beetles needed live trees to propagate, or perhaps the atmospheric pressure at low elevation was too high for them. It turned out the solution was as simple as a click of a button. Once the air conditioner started pumping, eggs came out within days. Today, breeding rhinoceros and stag beetles in a climate-controlled room is common sense. However, there are several ways to a cool environment. The hobbyist



↗深山鍬形蟲需要溫控。圖為作者在中國四川康巴3800公尺高山採集的未命名種。採集時溫度只有5°C。此種飼育溫度設在15°C。33 mm。2006

*Lucanus* stag beetles require temperature control. Pictured is an unnamed *Lucanus* species collected by the author in Szechuan, China at elevation 3800 meters. The temperature was only 5°C. This species is bred at 15°C.

**冷氣機 Air Conditioner :**

優點 Advantage : 空間無限 unlimited space

缺點 Disadvantage : 耗電量所有方式中最高 expensive electric bill

**冰箱 Refrigerator :**

優點 Advantage : 省電 energy saving

缺點 Disadvantage : 空間相當有限 limited space、震動 vibration、  
通風不良 poor ventilation**大寶麗龍箱加冰塊 Large Styrofoam Box with Ice :**

優點 Advantage : 無電費 no electric bill

缺點 Disadvantage : 溫度動盪大 temperature fluctuation、  
每日需人力補足冰塊 periodic ice replacement、  
通風不良 poor ventilation

冷氣機又分成兩大類：變頻與非變頻。如果型號選擇得當，變頻冷氣可比非變頻冷氣省電10-30%，但它的缺點是機體本身比非變頻冷氣貴大約一萬元以上。原理方面，非變頻冷氣一旦達到設定溫度以後壓縮機便會關機。等到室溫超過設定溫度時壓縮機又再度啟動。非變頻冷氣的壓縮機便一路開開關關。反之，變頻冷氣的壓縮機一旦啟動以後便不會關機，如果室溫已達到設定溫度，變頻冷氣的壓縮機便會轉為低速運作，室溫升高時再轉為高速運作。冷氣最耗電的時候就是啟動壓縮機時。由於非變頻冷氣的壓縮機永遠開開關關、走走停停，因此變頻冷氣會比非變頻冷氣省電。但是要變頻冷氣達到省電的能效有一個前提，也就是購買的冷氣機負載能力必須超越房間的坪數。舉例而言，

tries to find one that is most suitable for him or her.

Here in Taiwan, air conditioners come in two major types. One is traditional AC and the other is energy-saving AC. If the correct model is chosen, energy-saving AC can save 10-30% energy. However, the machine itself is more expensive to begin with. With traditional AC, the compressor shuts off once the set temperature is achieved. The compressor turns on again when the ambient temperature exceeds the set temperature. On the other hand, once the compressor of an energy-saving AC is turned on, it never shuts off. If the set temperature is reached, the compressor switches to low speed. Because the compressor of a traditional AC is constantly turning on and off, it's more energy-consuming. However, in order for an energy-saving AC

如果蟲房坪數為6坪，購買變頻冷氣時就務必要購買可負載7坪或是以上的機種，千萬不要購買只能負載6坪或以下的機種。如果買的機型太輕、無法將室溫降低至設定的溫度，壓縮機將永無止境地以高速運轉，不但沒有辦法達到省電的功能，可能連蟲都養不成。對於養蟲非常講究的朋友，則甚至可以考慮同時有冷暖功能的變頻冷暖機。這樣的機器不論夏天有多熱或是冬天寒流來襲時有多冷，都可以將溫度控在設定範圍。但是相對地，這樣的機型會比變頻冷氣貴上大約五千元以及整年度的用電量也會大大地提高。購買冷氣時有一點一定要注意，那就是有些機種在停電通電後不會繼續運轉，需要人為重新開機。這種冷氣相當地危險。有一次下班回家後興高采烈地準備要看蟲，結果一開蟲房時撲來的卻是一陣熱風，原來是稍早跳過電。購買新冷氣機時務必當場測試機種是否跳電後，或是停電通電後會繼續運轉。另外，使用變頻冷暖機時，有一個省電方式就是冬天控在20度，夏天控在24度。使用冷氣房養蟲時，我每隔2-3天就會把房門和窗戶打開透氣15分鐘，目的是避免舊空氣長期地累積。

冰箱方面，要特別注意的是，養蟲用的冰箱並不是直接拿家用冰箱來使用。家用冰箱的溫控範圍一般在-5度到10度，直接養蟲太寒冷了。家用冰箱務必經過改造以後方可使用。而改造的方式為將冰箱的原控溫器拆除，另外裝一個可溫控到至少25度的溫控器。改裝的過程其實並不困難，但是為了安全起

to conserve energy, its must have sufficient cooling capacity. If the model is too small for the room, the compressor will always be pumping, as not enough cold air is generated to reach the set temperature. For the serious hobbyist, an AC with internal heater can be considered. Such a machine allows total climate control whether in summer or winter. However, such a machine is slightly pricier than the standard energy-saving AC. When buying an AC of any kind, it is very important to select a model that will automatically resume after a power outage. My old AC lacked this function and I nearly lost all my larvae one summer. When using an AC with built-in heater, a great way to conserve energy is set the temperature to 20°C during winter and 24°C during summer. I open the door and windows to ventilate the rearing room every 2-3 days to prevent old air from accumulating.

When it comes to culturing rhinoceros or stag beetles in refrigerators, it's important to know that the household refrigerator needs to be rewired. The regular household refrigerator has a temperature range of -5 to 10°C, which is too cold for beetles. The original temperature controller needs to be taken off and a new one installed. The new controller should be able to set the temperature up to 25°C. Ask your local freezer equipment dealer to help you rewire your household refrigerator.

After the new temperature controller is installed, try to position the temperature sensor at medium height. This is because most



見，改裝的動作最好交給冷凍器材專賣店的專業人士。

新的控溫器安裝好後請將溫度感應器固定在冰箱的中央高度。這是因為冰箱的冷氣是由最上層吹出來的。如果把溫度感應器固定在冰箱上層，上層達到設定溫度、壓縮機停止後，冰箱下層可能還不夠涼。反之，如果把溫度感應器固定在冰箱下層，下層達到設定溫度、壓縮機停止時，上層可能早就已經太冷。但無論如何，即使是將溫度感應器固定在中央高度，最上層還是會比最下層來得涼一些。冰箱內各層之間些許的溫度差距並不會影響蟲生長。

冰箱完全改造完畢後請在冰箱上下層各放一支溫度計，開始進行溫測。控溫器難免會有小誤差，調22度並不代表冰箱內就一定會是22度，也有可能是20度或是24度。此時請適當調整轉盤，直到達到目標溫度。每做調整時請關起冰箱門並等待至少1小時才能得到較客觀的溫度判讀。完成溫測後千萬不要急著放蟲。請讓冰箱運轉至少2天。2天之後如果溫度都沒有異動方可開始養蟲。

除了家庭式的冰箱改裝後可以養蟲以外，還有另外一種冰箱也有許多蟲友使用，也就是在所有餐廳、超商都可以看見的「冷飲冰箱」。用這一類型的冰箱養蟲多半不需要再經過改造。一般蟲友家中是不會有這種冰箱的，如果有的話也都是特別買來養蟲的，也因此，在購買時就可直接挑選可控溫到24度的機型。這種冰箱又分為一門、雙門，以及多門。雖然多門式的可養更多的蟲，但

refrigerators blow out cool air from the top. If the temperature sensor is placed up high, the compressor will be cut off before the bottom of the refrigerator gets sufficiently cool. On the other hand, if the temperature sensor is placed too low, by the time the compressor is cut off, the top of the refrigerator is way too cold. But no matter what, the top of the refrigerator will always be slightly cooler than the bottom. But this will not affect beetle keeping.

Place one thermometer in the upper region and one thermometer in the lower region of the refrigerator to begin temperature test. There may be slight discrepancy. For example, the temperature is set to 22°C, but the actual temperature comes out to be 20°C or 24°C. Should this happen, adjust the dial accordingly. After each adjustment, wait at least one hour to get an accurate reading. Allow temperature to stabilize for at least two days before putting in beetles.

In addition to the rewired household refrigerator, there is another type of refrigerator suitable for beetle keeping. They are the kind frequently seen in gas stations and supermarkets for storing cold drinks. They come in one door, two doors, and multi doors. They do not require rewiring. Since most hobbyists don't have one at home, when purchasing one, make sure that you buy one with an ideal temperature range.

One of the biggest drawbacks with refrigerators is poor ventilation. In fact, there is no ventilation. As a result, it has to be

是相對的它也只能放在一樓，其他樓層根本搬不上去，就算是用吊車吊上去它的重量也可能會對樓層結構造成威脅。

所有冰箱最大的缺點就是完全密閉不透氣。如果鑽了氣孔又會增加壓縮機的啟動頻率。也因此，使用冰箱飼育時務必每天開門透氣一次。冰箱飼育並不適合時常需要出遠門的蟲友。另一缺點是，壓縮機啟動時會造成整座冰箱震動，對幼蟲造成某種程度的干擾，也因此有些蟲友會特別在飼養容器下方墊一塊防震墊。冰箱最大的缺點毫無疑問地就是空間的限制。一般冰箱連一個大兜蟲的產卵箱都放不下，最多也只能養幾隻大兜幼蟲，跟不能養蟲其實沒有什麼兩樣。為了能夠繁殖大兜或是飼養更多的種類，蟲友通常很快地便捨棄冰箱，邁向冷氣房之路。個人的建議是，除非目標是飼養深山锹形蟲（體型不大）而且又欲控溫在18-20度，否則投資冰箱很可能是一筆無謂的花費。不過冷氣房養蟲也是有陷阱的。許多蟲友認為養10隻幼蟲或是100隻幼蟲電費都是一個月一千元，於是抱著要「回本」的心態越養越多，到最後照顧不來，苦到的反而是幼蟲。由於這些都是生命，請大家量力而為。

→ 冷飲冰箱飼養兜蟲的情形。林琨芳提供

Refrigerator for rhinoceros and stag beetles in use. Provided by Ralf Lin

opened at least once a day. It is not suitable for the hobbyist who frequently makes business trips. Another drawback is that it vibrates whenever the compressor is running. Vibration is a disturbance to larvae. Some sensitive larvae may stop feeding. As a result, some hobbyists put a piece of cloth in between the refrigerator shelves and rearing containers. However, the biggest drawback of them all is lack of space. Most refrigerators can't even fit a breeding tank for giant rhinoceros beetles. At best, they can only rear a few giant rhinoceros beetle larvae. If you have large scale breeding in mind, the refrigerator won't do. My advice is, unless the species of interest are *Lucanus* stag beetles, which are small to medium sized and require strict temperature control, go with air conditioner.

